



*What's new in MODIS Collection 6
Aerosol Deep Blue Products?*

*Photo taken from Space Shuttle:
Fierce dust front over Libya*

*N. Christina Hsu, Rick Hansell, MJ Jeong, Jingfeng Huang,
and Jeremy Warner*

Laboratory for Atmospheres

NASA Goddard Space Flight Center, Greenbelt, Maryland USA

Changes in MODIS Collection 6 Deep Blue Algorithm

- 1. Extend Terra Deep Blue products beyond 2007 using best calibration corrections***
- 2. Improve Terra/ Aqua surface reflectance estimation***
 - Adding dependence of surface reflectance on NDVI values to detect surface property changes over desert, semi-desert as well urban regions***
 - Expanding retrievals into vegetated areas***
- 3. Recover aerosol retrievals over dry regions due to cirrus over-screening using MODIS 1.38 μm band***
- 4. Introduce integer QA flags as part of SDS array***



Polarization/RVS Correction

C006 Tests:

Deep Blue Aerosol Retrieval Algorithm

MODIS Working Group Meeting

18-20 May 2011

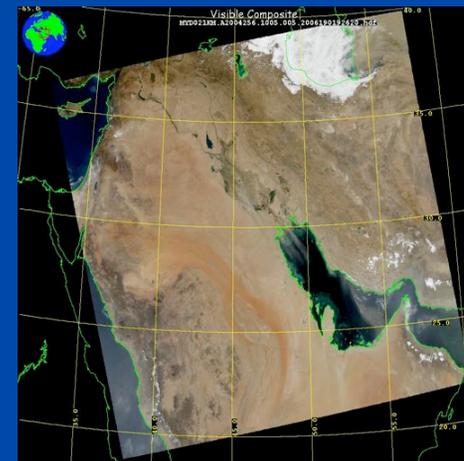
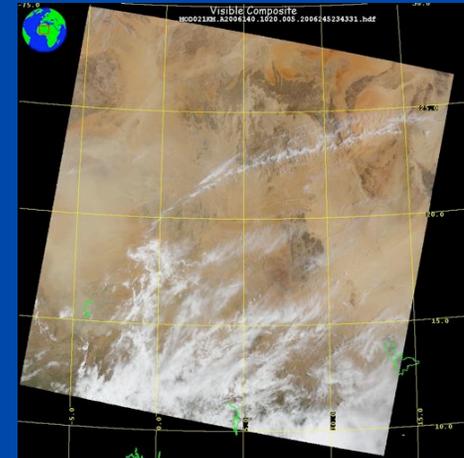
Richard A. Hansell Jr.

Richard.A.Hansell@nasa.gov (301.614.6132)

Acknowledgements: B. Wenny (Sigma Space Corp), G. Meister (GSFC), B. Franz (GSFC), MCST group, B. Ridgway (SSAI), and J. Kuyper (Sigma Space Corp.).

Outline

- Background
 - Previous Work/Current Study
- Spatial/Temporal Coverage and L1B Data
- Deep Blue AOT Comparisons
 - MISR
 - AERONET
- Summary



Polarization/RVS Corrections (Background)

- Extension of work performed by Jeong et al. 2011 (*IEEE Trans. Geosci. Remote Sens.*)
 - Study focused on B8 (412 nm) corrections utilizing GSFC's OBPG cross-calibration method (Kwiatkowska et al. 2008) using C5.1 L1B Terra data.
 - Significant improvements found in DB retrieved AOT after corrections.
 - C5.1 DB AOT products have been re-processed using these procedures for Mar 2000 - Dec 2007. See LAADS archive (<http://ladsweb.nascom.nasa.gov/>)
 - For C6, coverage is extended through 2010 using OBPG updated x-cal data.
- Current work assesses performance of B8 corrections using C6 L1B Terra/Aqua MODIS data based on OBPG x-cal and MCST calibration methodologies.
 - Estimated B3 (466 nm) corrections are also evaluated. B9 /B10 (443/488 nm) correction factors are wavelength interpolated.
 - DB retrieved parameters used for comparisons (AERONET + MISR)

TOA total radiance, I_t

$$I_t = \frac{1}{p_c M_{11}} I_m$$

$$p_c = \frac{M_{11}}{M_{11} - m_{12} (Q_t \cos 2\alpha + U_t \sin 2\alpha) / I_m - m_{13} (-Q_t \sin 2\alpha + U_t \cos 2\alpha) / I_m}$$

- I_m : TOA MODIS measured radiance
- p_c : Polarization correction factor
- $1/M_{11}$: Response-Versus-Scan (RVS)

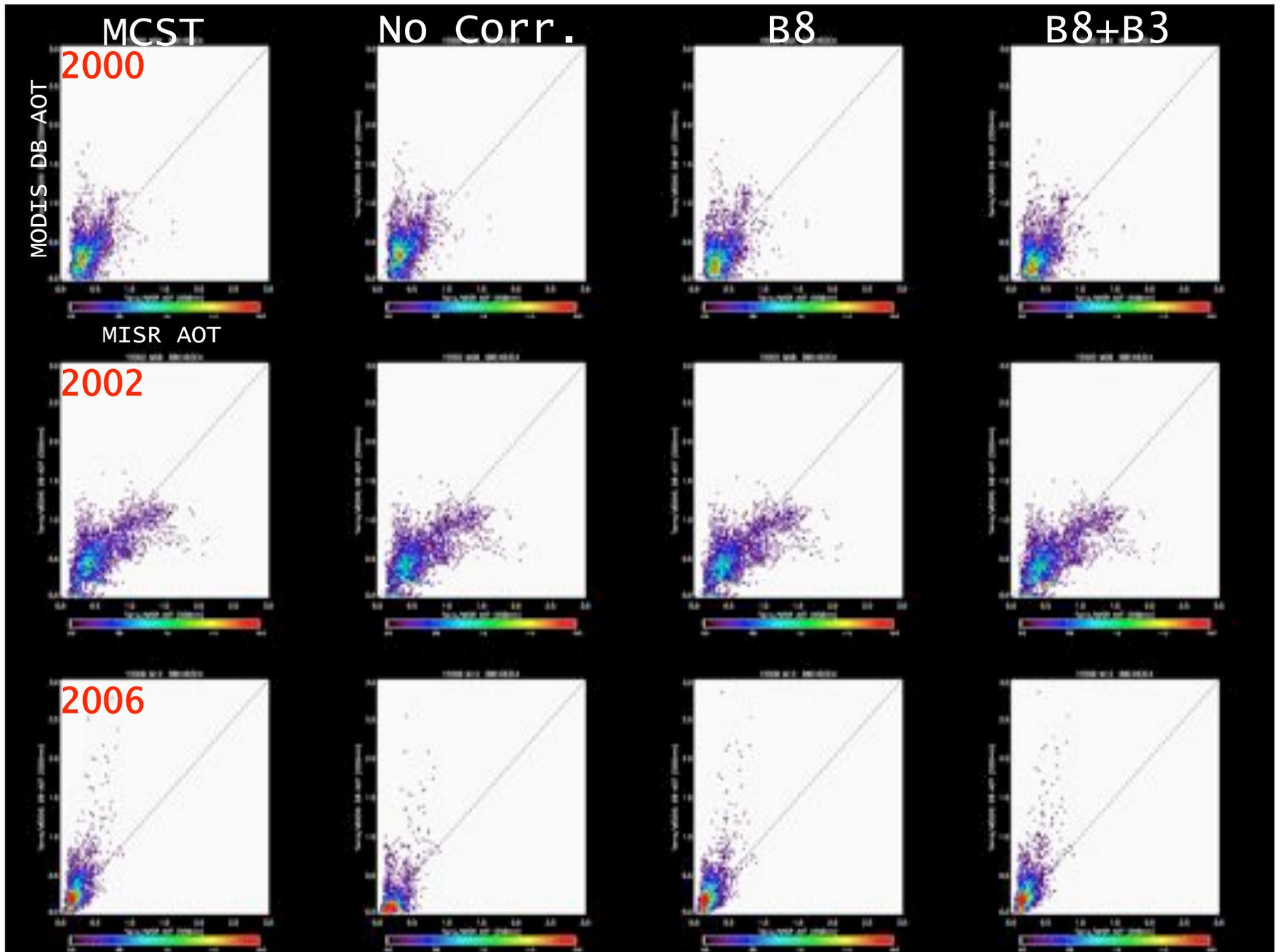
Spatial/Temporal Coverage + Data

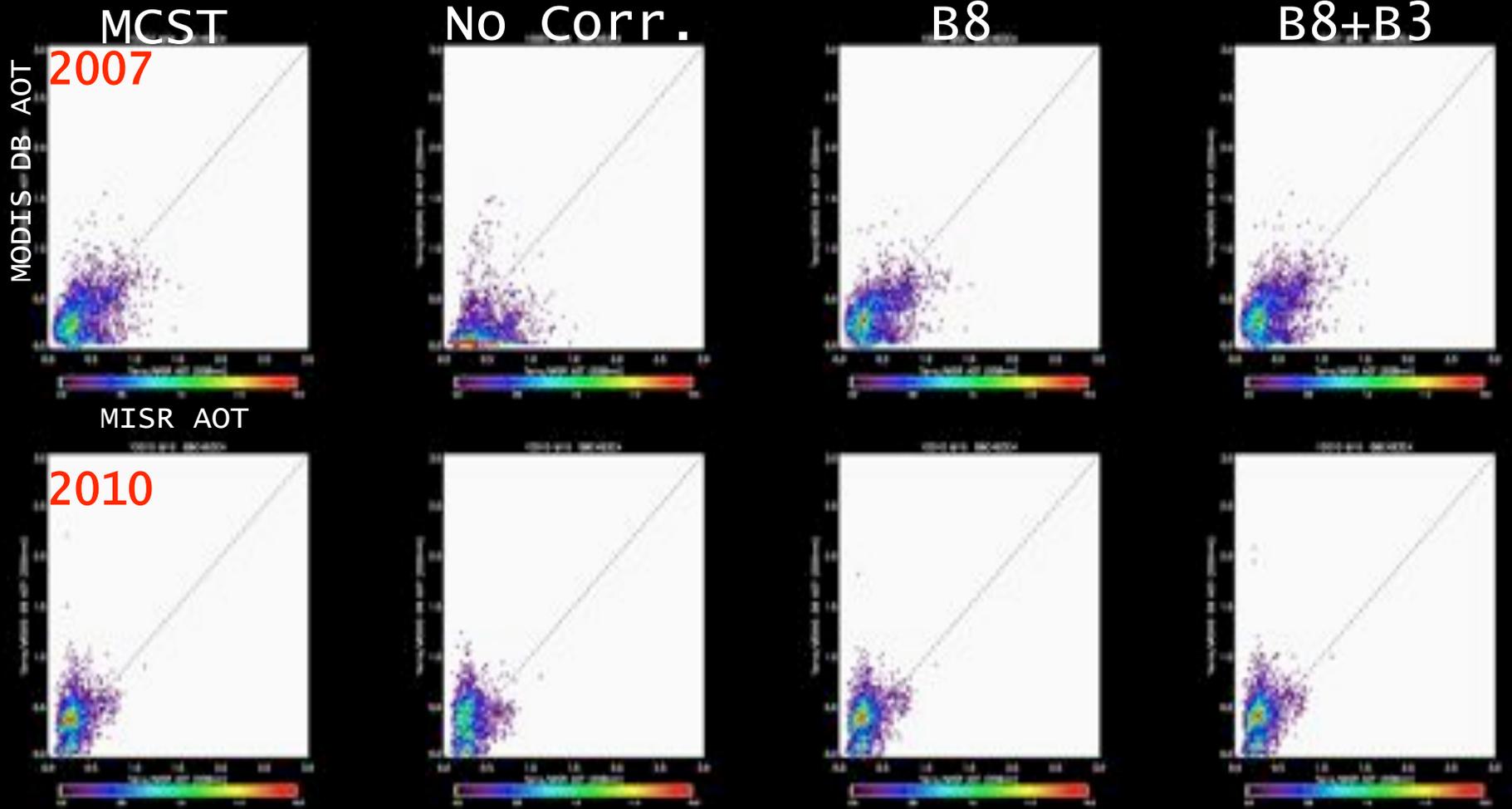
- 29 days spanning Y2000-2010 (Terra) and Y2002-2010 (Aqua)
 - On average: 2 test days/year
- Geographical domain covers: 20W-60E;0-35N (arid/semi-arid surfaces)
- Apply OBPG corrections (Vicarious calibration method – Kwiatkowska et al. 2008, *Appl. Opt.*) to B8:
 - LUT version xcal_modist_txc08a
 - updates planned this summer
- MCST corrections: Terra (multiple band from EV data 1-4, 8, and 9), and Aqua (8 and 9 from EV data)



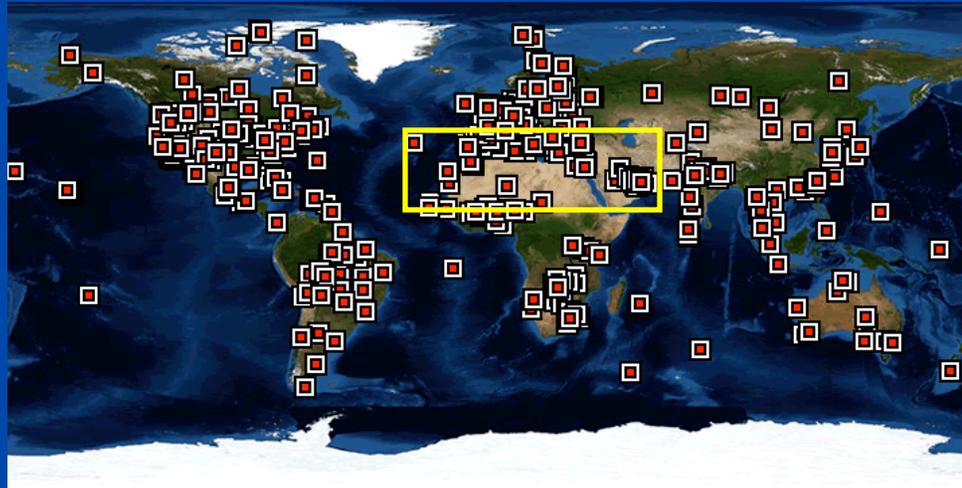
Baseline		MCST	
<i>Terra</i>	<i>Aqua</i>	<i>Terra</i>	<i>Aqua</i>
PGE02 v6.1.6_3 AS 313	PGE02 v6.1.7_3 AS 365	PGE02 v6.1.12 ¹ AS 355	v6.1.13 ¹ AS 355

MODIS DB VS. MISR AOT

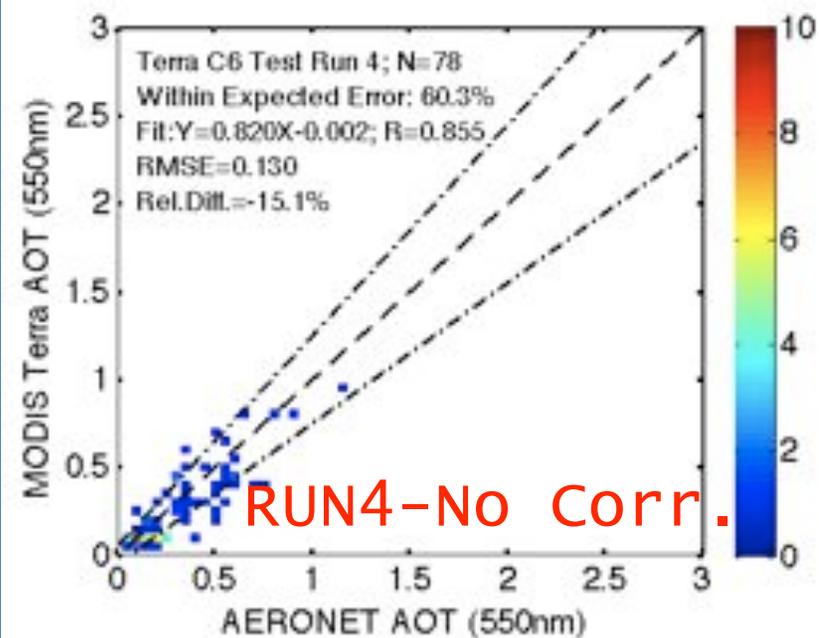
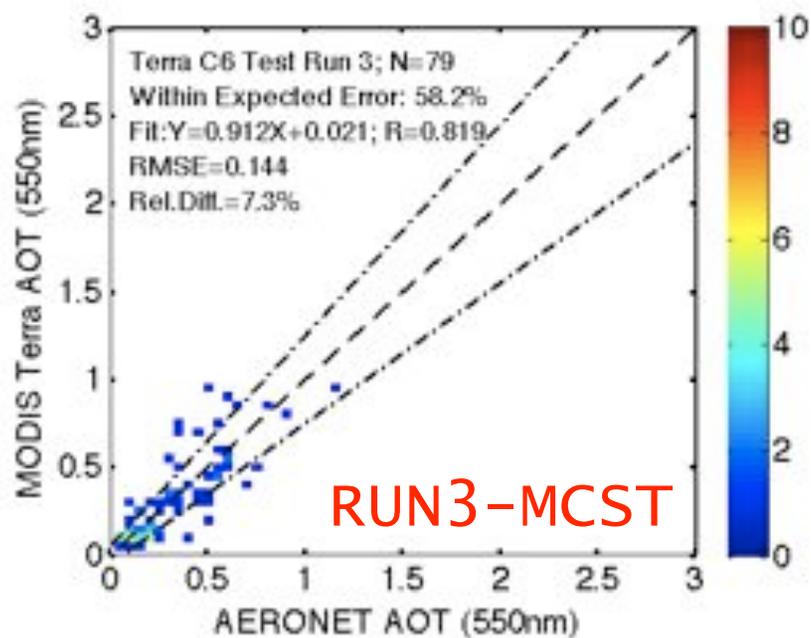
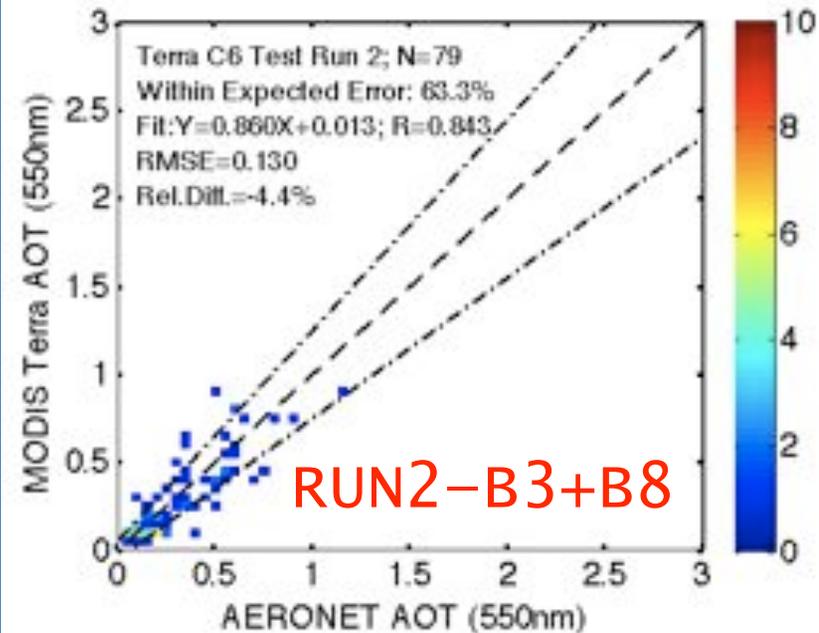
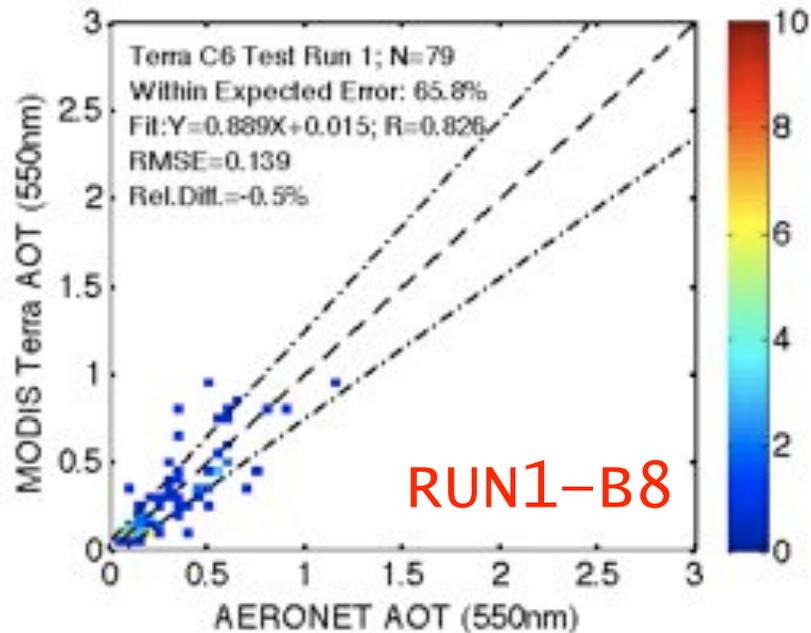




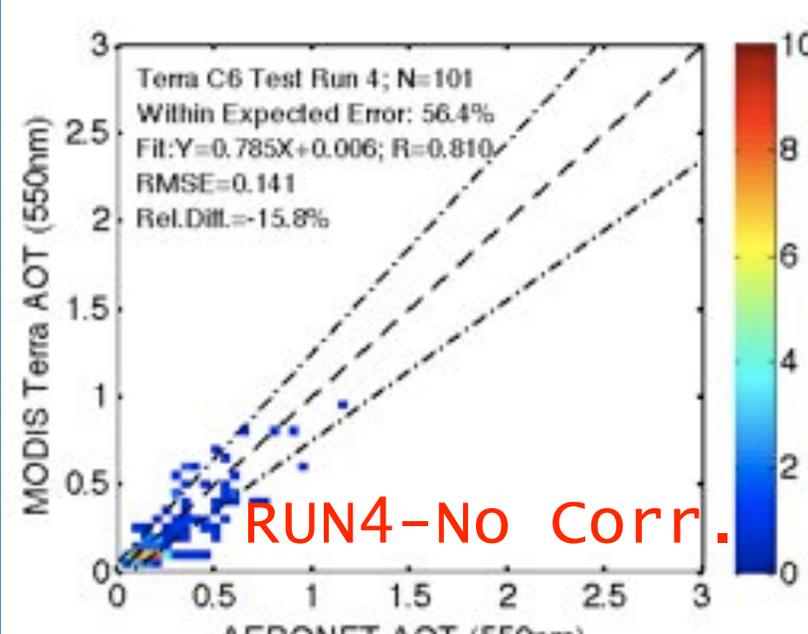
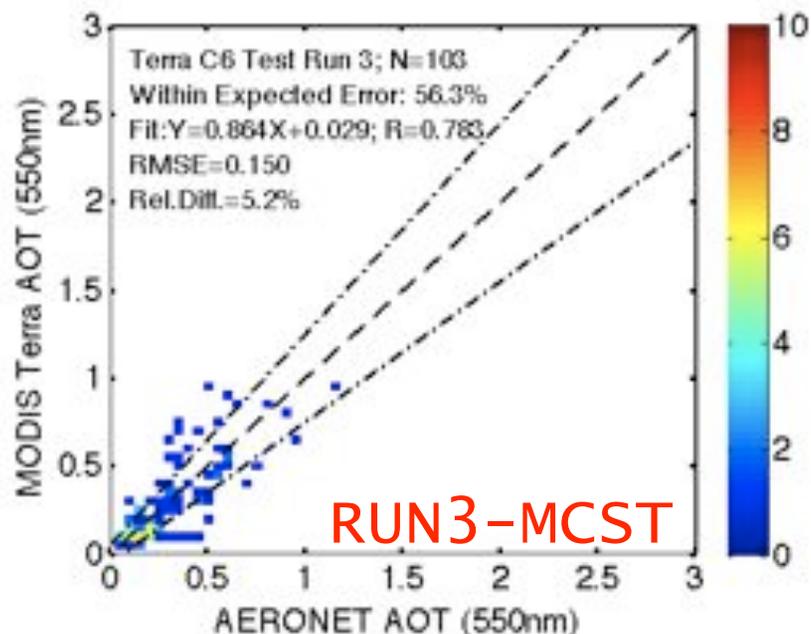
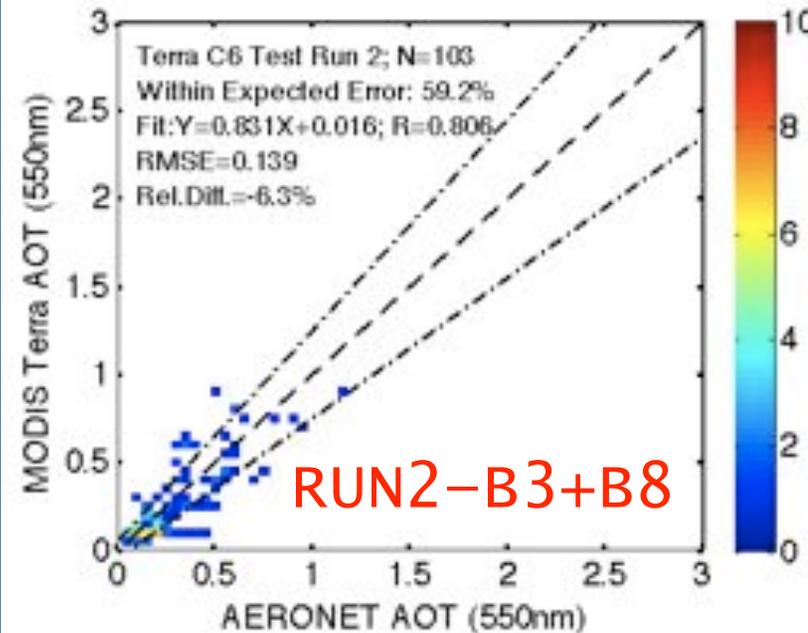
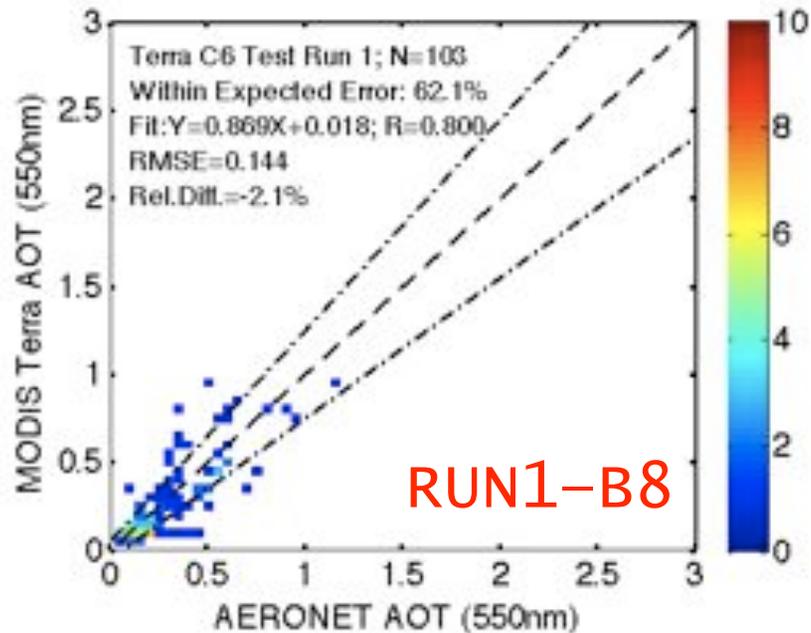
MODIS DB vs. AERONET AOT



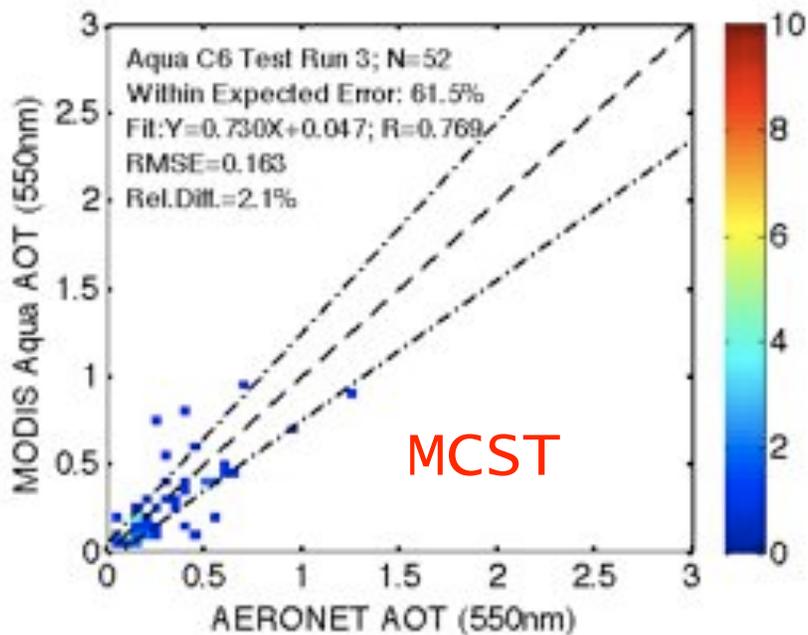
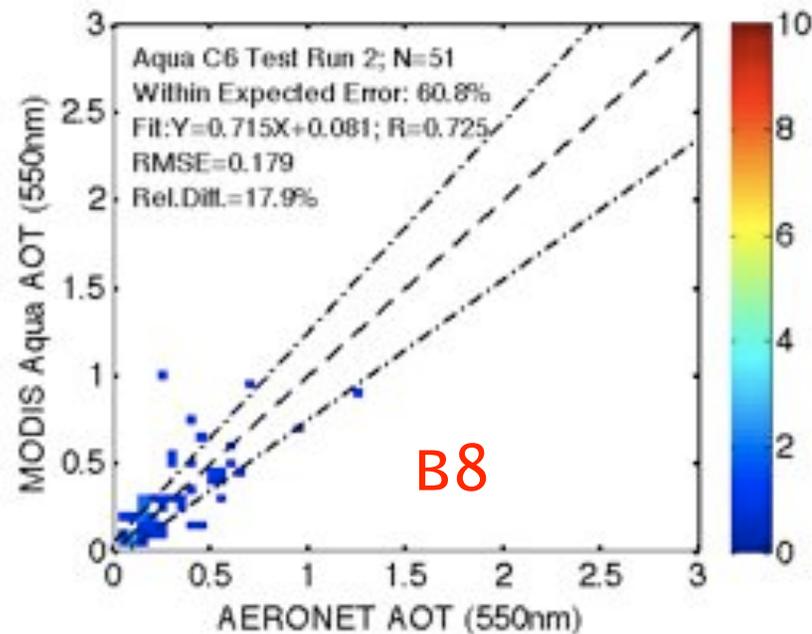
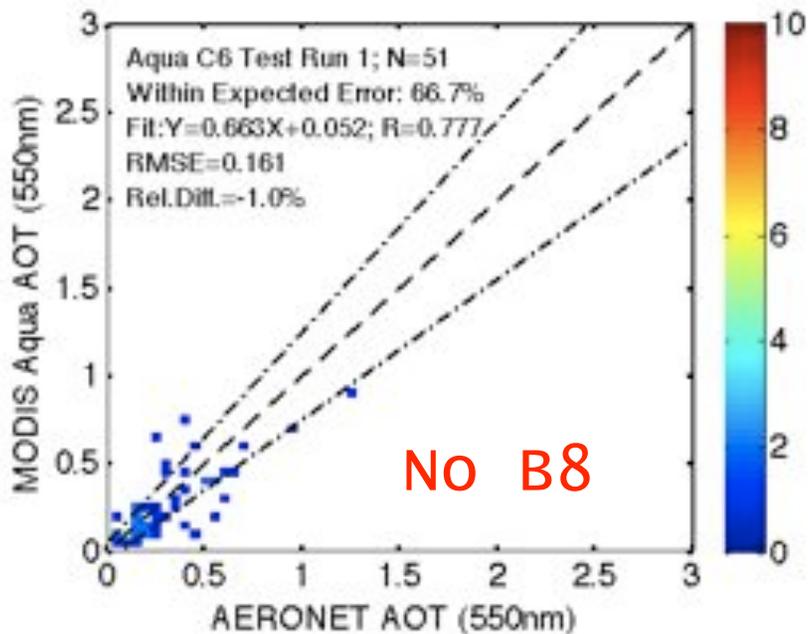
TERRA, QA=3 ONLY



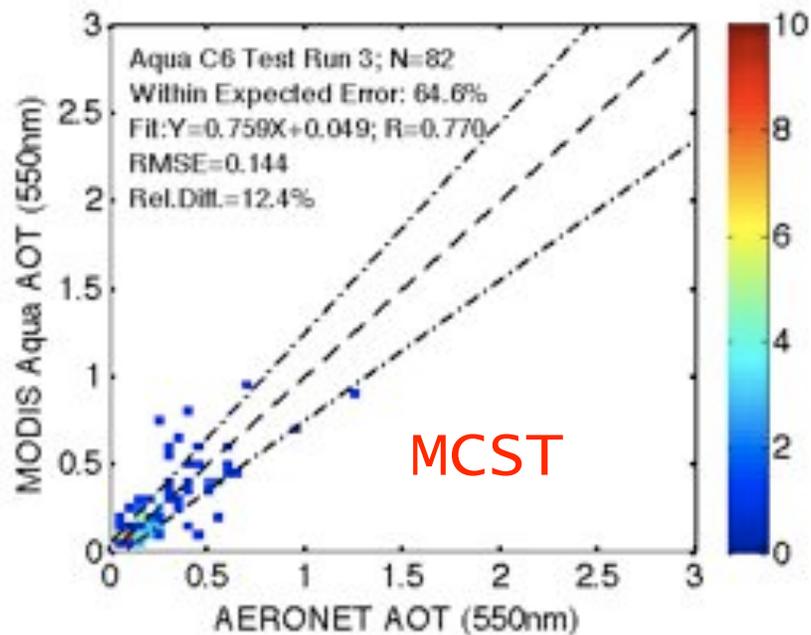
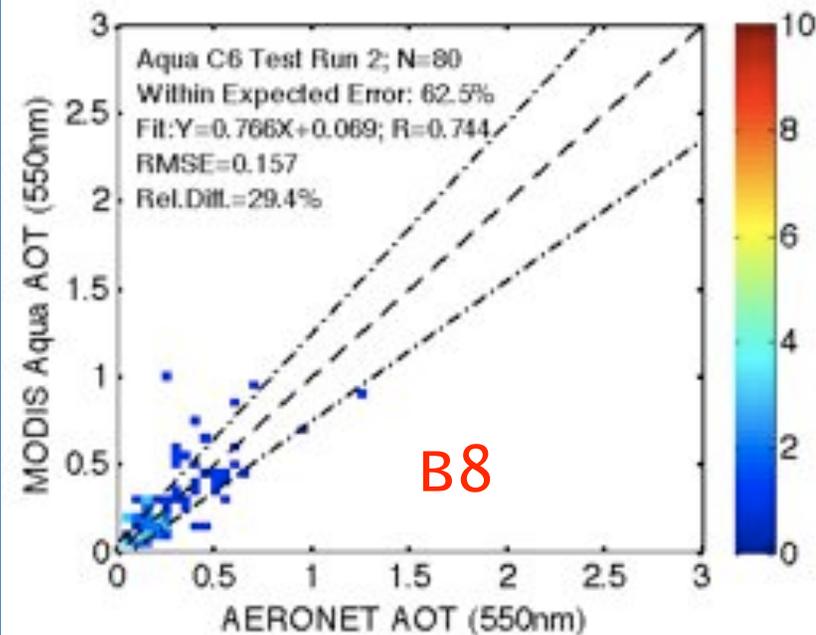
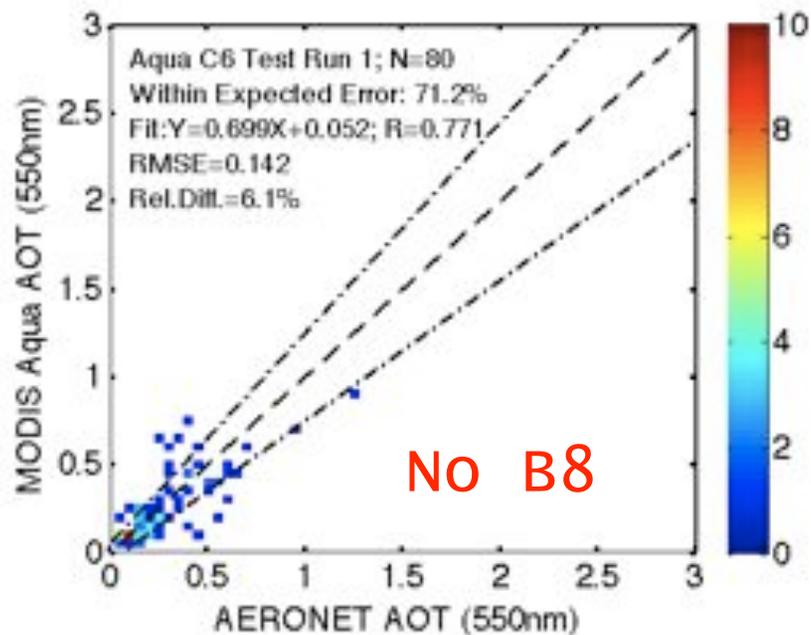
TERRA, All QA



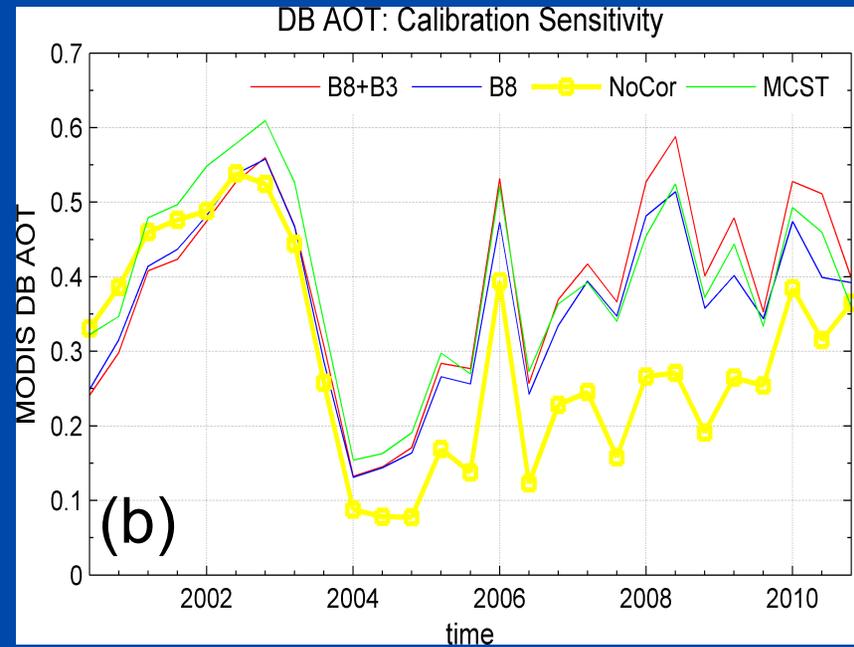
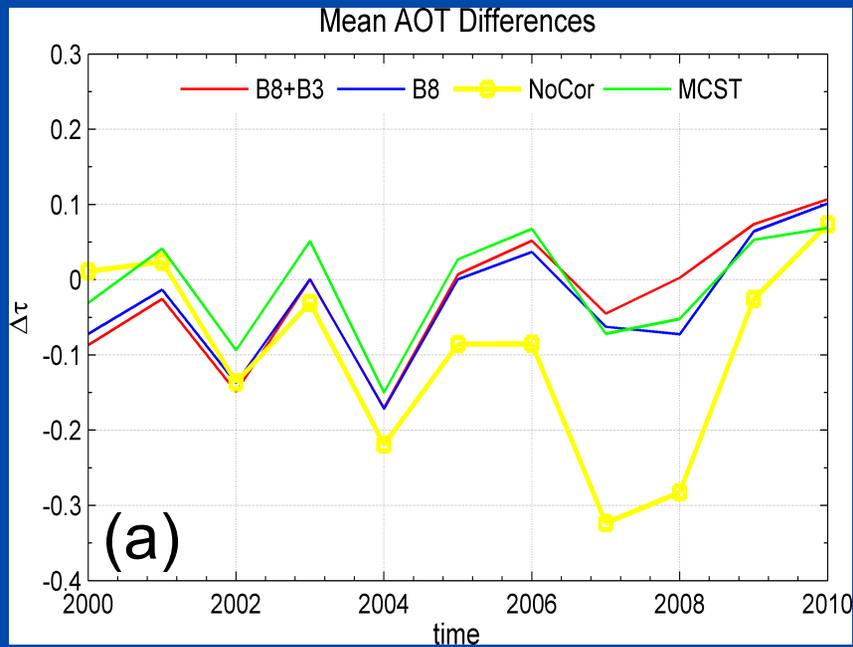
AQUA, QA=3 ONLY



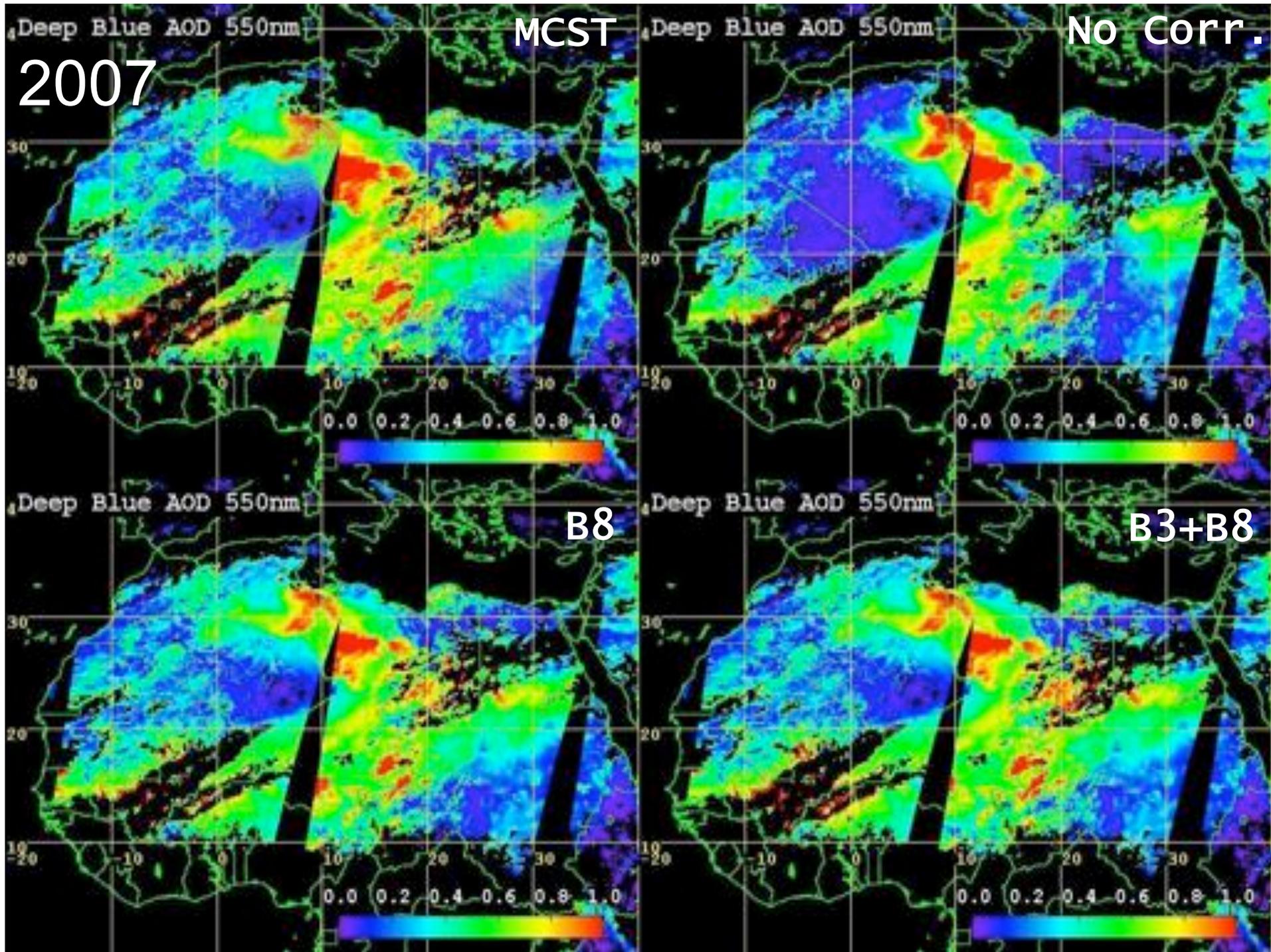
AQUA, All QA

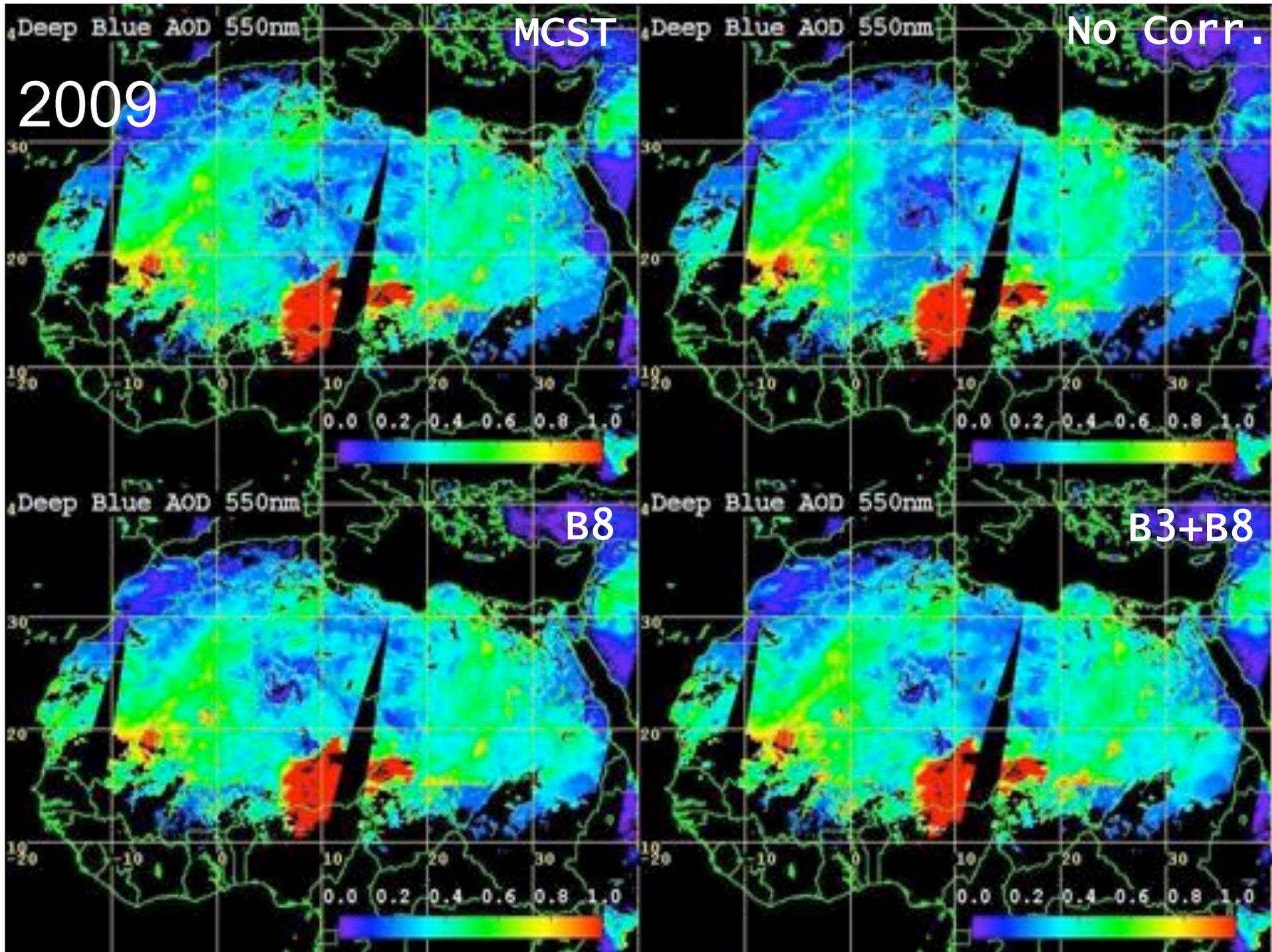


MCST vs. OBPG Band Corrections: Comparisons Using Deep Blue



Deep Blue retrieved AOT using MCST and OBPG correction schemes for Terra MODIS reflectance data. Panel (a) mean AOT differences between Terra MODIS DB and MISR. Panel (b) Comparison of mean DB retrieved AOT.





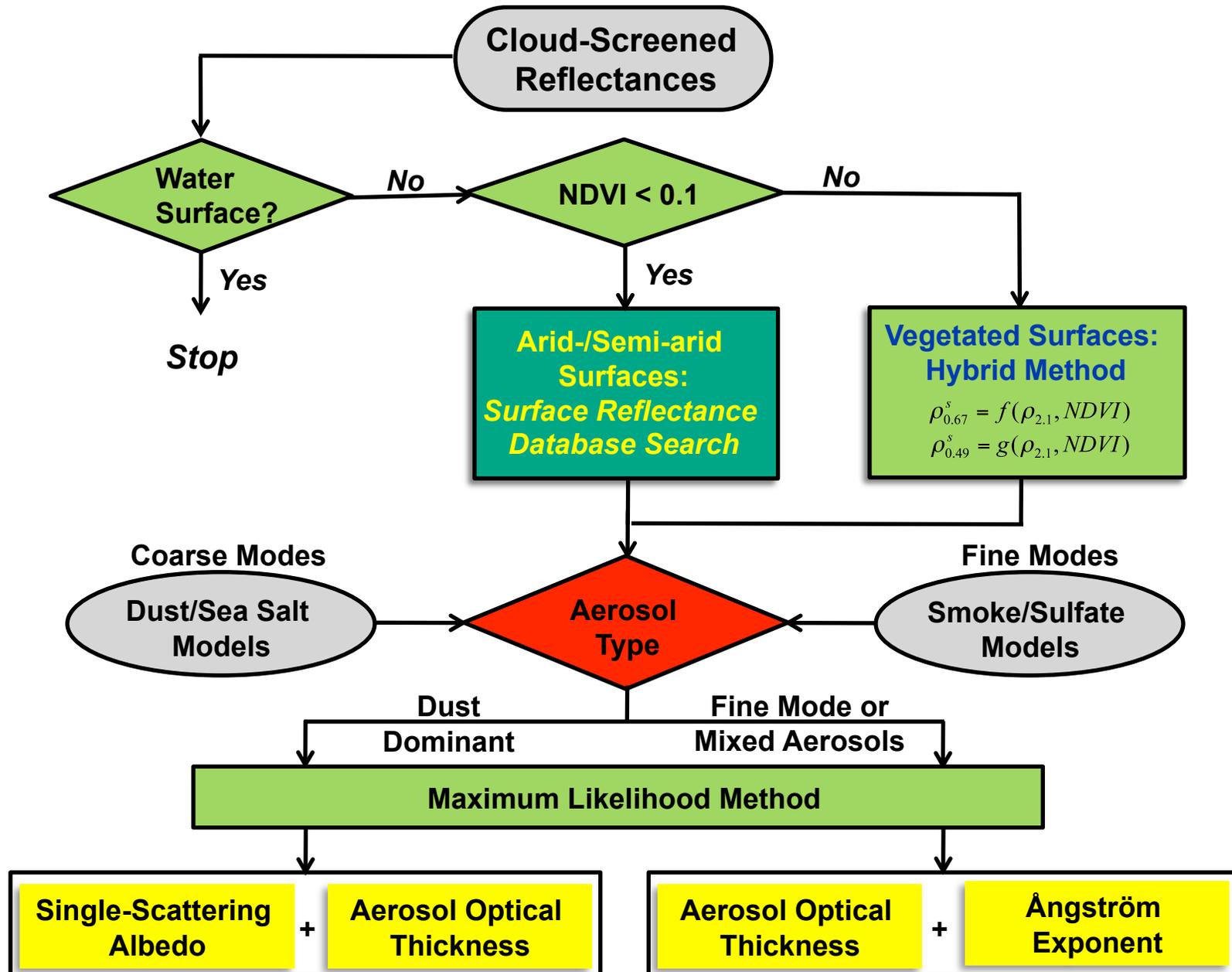
Summary

- Differences between MCST and OBPG calibration methods for C6 are small in terms of DB retrieved parameters.
 - For given test cases, the performance of MCST and OBPG schemes is comparable.
- Recommend performing further testing using more extensive L1B datasets before C6 delivery.
 - Ideally need monthly datasets for select years to generate adequate statistics.

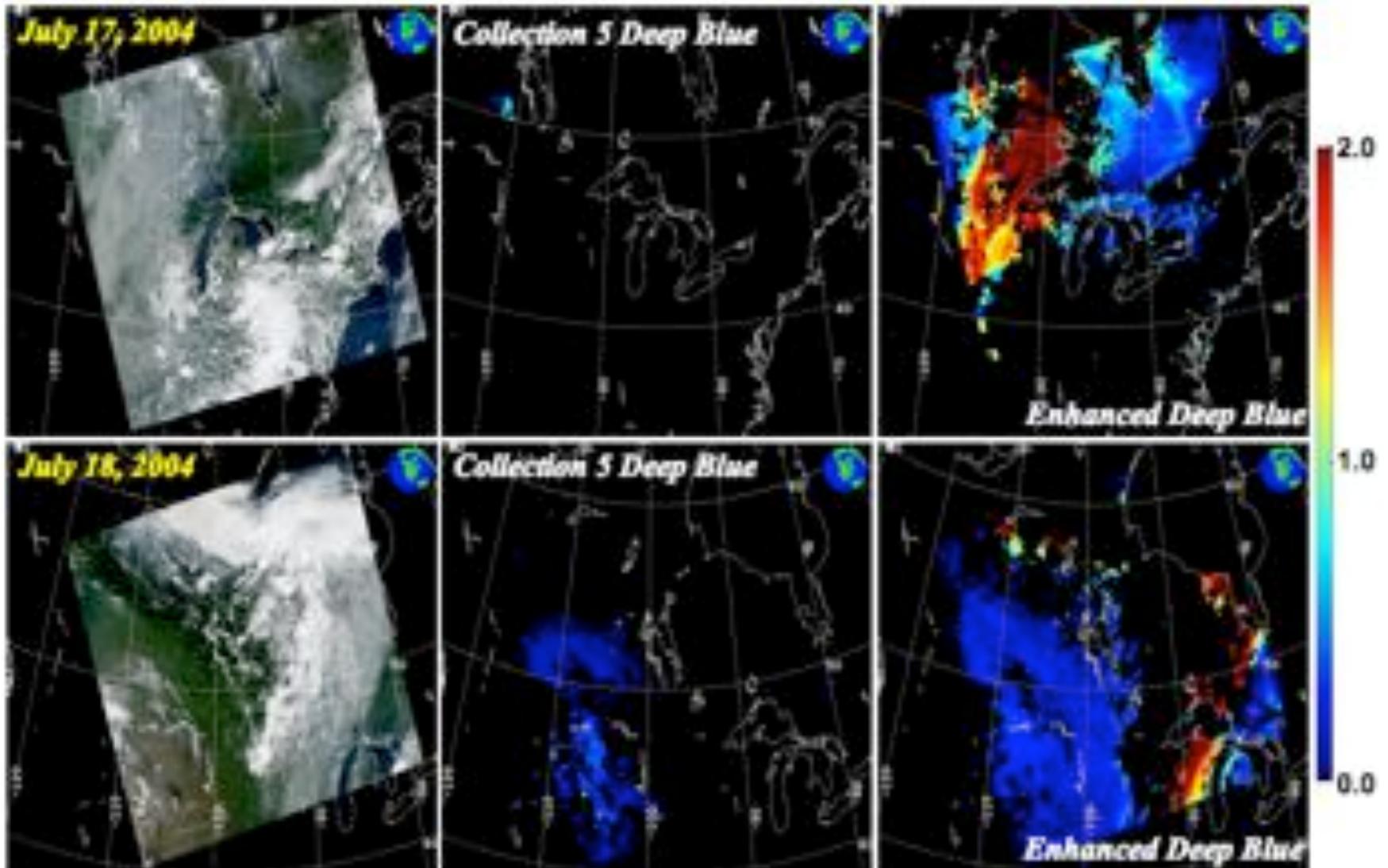
Changes in MODIS Collection 6 Deep Blue Algorithm

- 1. Extend Terra Deep Blue products beyond 2007 using best calibration corrections***
- 2. Improve Terra/Aqua surface reflectance estimation***
 - Adding dependence of surface reflectance on NDVI values to detect surface property changes over desert, semi-desert as well urban regions
 - Expanding retrievals into vegetated areas
- 3. Recover aerosol retrievals over dry regions due to cirrus over-screening using MODIS 1.38 μm band***
- 4. Introduce integer QA flags as part of SDS array***

Flowchart for Deep Blue Algorithm

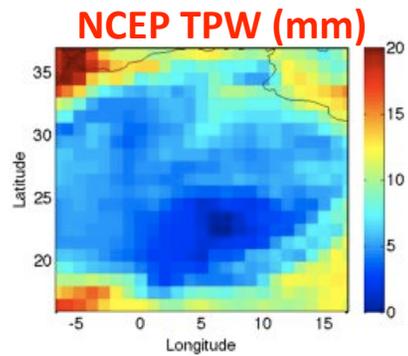
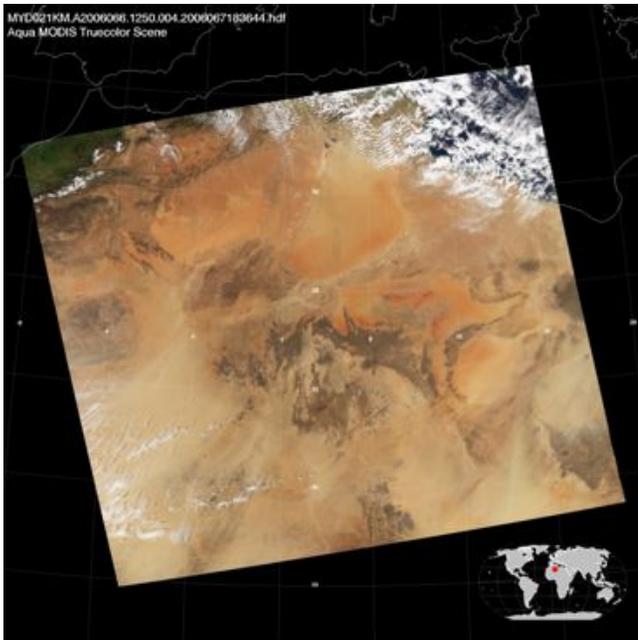


Retrieving Aerosol Properties over Vegetated Regions in Collection 6 Deep Blue

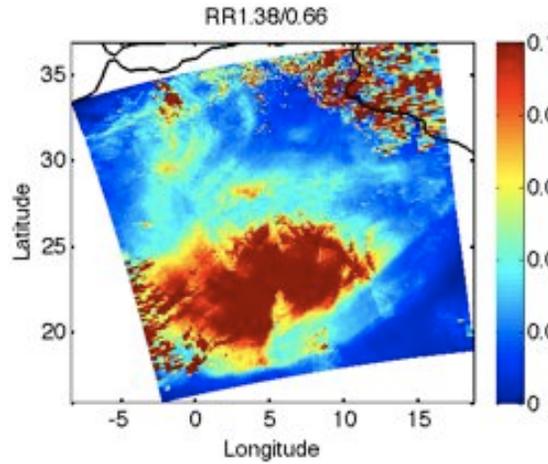


Improving Over-Screening of Thin Cirrus in Deep Blue

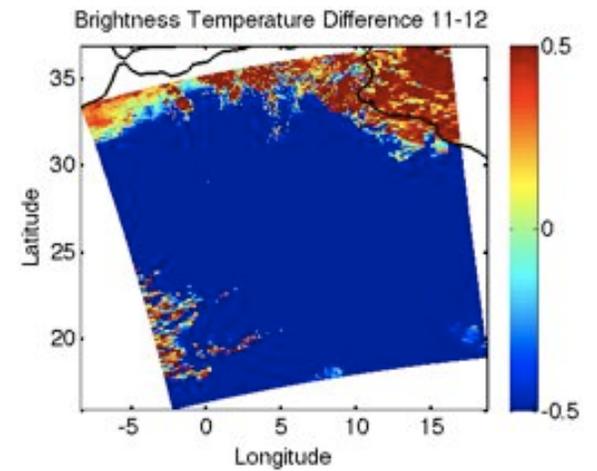
over Sahara on 2006/03/07



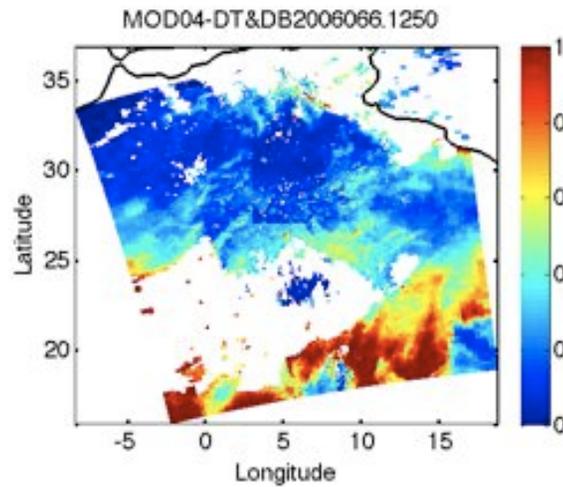
RR1.38/0.66



BTD11-12



AOT C5.1



AOT C6

